NOAA Critical Infrastructure Protection (CIP) System (NOAA CIPS)

FY 2003

Commerce IT Review Board

June 2001

Background: FY 2003 Budget

- **CIPS budget requirement $10.21M in FY03**
  - First year funding request reduced by $10M from FY02 submission
    - *Resources for climate research deleted*
    - *System downsized*
    - *System sized to meet operational requirements*
      - *Sustain ability to issue watches and warnings*

- **Recurring funds at $10.8M per year required to sustain proposed CIP systems**
  - Recurring funding reduced by $5.7M per year from FY02 submission
    - *System downsized*

What is being proposed?

- **Separate operational backup systems for:**
  - Resources sufficient to **backup of 100% of the operational products at operational schedules**
    - *NWS NCEP Central Computer System (CCS)*
    - *NESDIS Office of Satellite Data Processing and Distribution (OSDPD)*
    - *Support (maintenance, facility, refresh) and telecommunications included*

- **Compliance with Presidential Decision Directives**
  - 67 : Continuity of Operations and
  - 63 : Critical Infrastructure Protection

- Investigating a consolidated NOAA Critical Infrastructure Protection System (CCS, OSDPD) to ensure uninterrupted flow of essential data and products.
  - Potential cost avoidance[3] if co-located.

What is being proposed?

- Elimination of **single points of failure** for critical systems:
  - **CCS**: NWS weather and climate forecasting models are run on a single high performance computer system.
    - *Primary: 100% operational backup*
    - *Secondary: When not used for backup, resources can meet research and development goals*
      - National Test Bed for meteorological model development
      - Joint Center for Satellite Data Assimilation
  - **OSDPD**: single facility, utilizing IBM mainframe computers, processes and distributes operational and highly perishable data and products from environmental satellites.

Basis for investment

- **Current Backups are Inadequate or Non-existent**
  - **CCS backup**
    - Uses alternate source products from Navy, Air Force, OAR, UKMet
      - *Products from these sources not guaranteed*
      - *Does not provide 100% operation products at operational schedules*
      - *Backup product generation is not under NCEP control*
    - NWS products are degraded in both accuracy and timeliness when alternate source products are used.
  - **OSDPD** has **no backup**
    - 87% of all data input to the operational forecast models are derived from satellites and processed by OSDPD

NOAA's CIP

Providing Computational Resources for the NCEP Disaster Recovery

OPERATIONAL (Total nodes needed 256) [100% of operational system]	**Minimum Disaster Recovery*** (Total nodes needed 256)	**CURRENT BACKUP**
Medium Range Forecast 1x / 75km / 384 hours	Medium Range Forecast 1x / 75km / 384 hours	**Not Available**
Eta 4x / 22km / 84 (48) hours *(moving to 12km in Nov 2001)*	Eta 4x / 22km / 84 (48) hours	Air Force MM5 4x / 45km / 60 (48) hours
Aviation (AVN) 4x / 75km / 126 (84) hours	Aviation (AVN) 4x / 75km / 126 (84) hours	Navy NOGAPS 2x / 81km / 120 hours
Rapid Update Cycle (RUC) 24x / 40km / 12 hours	Rapid Update Cycle (RUC) 24x / 40km / 12 hours	Rapid Update Cycle 24x / 40km / 12 hours
Nested Grid Model (NGM) 2x / 80km / 48 hours	Nested Grid Model (NGM) 2x / 80km / 48 hours	Not Available (no Model Output Stats - MOS)
Hurricane (4 storms) 4x / 18-110km / 126 (84) hrs	Hurricane (4 storms) 4x / 18-110km / 126 (84) hrs	Navy Hurricane (2 storms) 2x / 18-110km / 72 hours
Ensembles 2x / 75km / 120 hours	Ensembles 2x / 75km / 120 hours	Web access to Canada, ECMWF, etc. (varies)
Wave (NWW3) 2x / 110km / 120 hours	Wave (NWW3) 2x / 110km /120 hours	Navy WAM 2x / 110km / 72 hours

* Determined through the NWS OCWWS

[times per day / resolution / length of forecast (off-cycle length)]

Impact from loss of NWS operational Hurricane Model

Unnecessary Preparedness Costs

Alternate Source: Model for current backup of NWS supercomputer	Average 24 hour track guidance error for the 2000 season (NCEP/TPC)	Delta from NWS Operational Hurricane model track error	Additional annual cost (1)
Navy FNMOC (GFDL version)	85 miles	+16 miles	$17,280,000
Navy NOGAPS	91 miles	+22 miles	$23,760,000
			Average is **$20,520,000** in preparedness cost increases over operational model

1. Costs assume average of 1.8 landfall hurricanes per year and average preparedness at $600K/mile (NCEP/TPC). Per Chris Adams, CSU, 1999 a ***single worst case for a misplaced Galveston/Houston hurricane is $200 - $300 million..***

Basis for investment: Contribution to the Nation

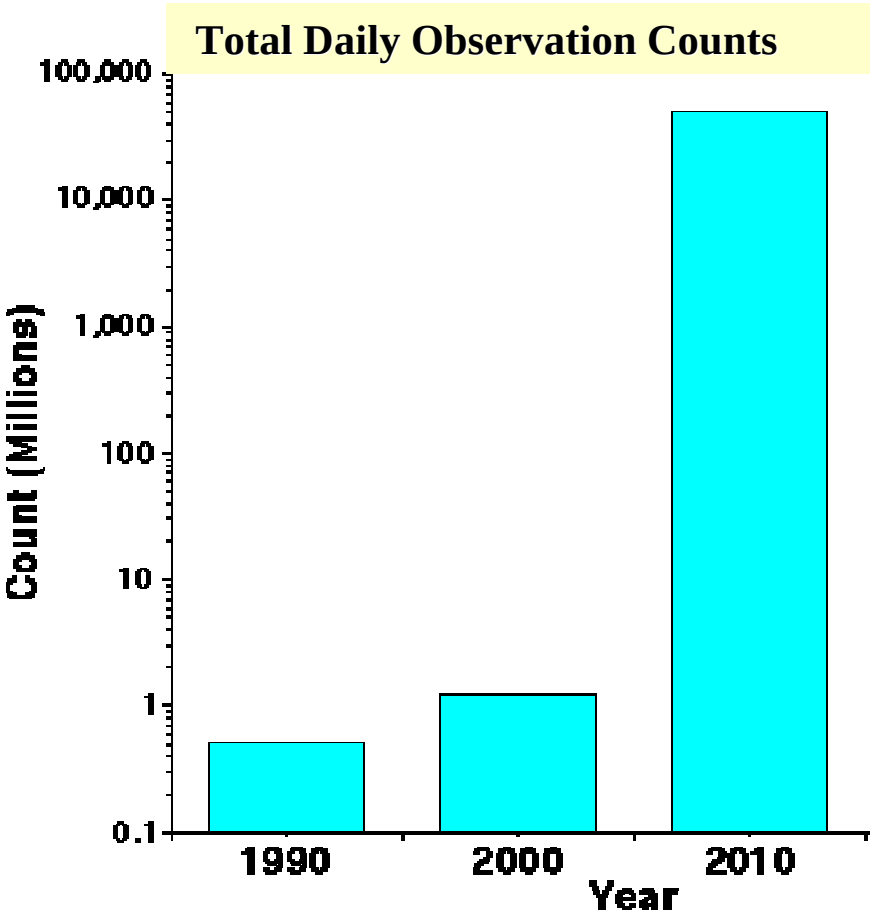
- **Ensures continuity of mission critical operations and objectives**
  - Eliminates extended outages (few hours vs many hours, days, weeks, or months) for forecast model production and satellite data processing.
  - Provides significant cost avoidance for degraded services (e.g. hurricane tracks)
  - Compliance with PDD's
  - R&D functions are not supported
- **Customers receive uninterrupted service**
  - Same product suite
  - Same delivery times
    - *Sustains service to the **$200M**+/year commercial weather industry*

Basis for investment: Contribution to the Nation

- **Provides important computational resources to:**
  - Leverage large investments in government and academic research and development in numerical weather/climate prediction.
    - *National Test Bed for meteorological model development*
    - *Joint Center for Satellite Data Assimilation*
    - *Accelerate transition of operational research and new satellite data into operations*
    - *Faster ROI for new satellite systems and instruments*
  - Protects base investments in the NWS and OSDPD operational systems and models

NOAA CIP
Utilized to improve "ROI" in satellites

- **Faster operational forecast improvements accelerate the ROI to the taxpayer**
- **Joint Center for Satellite Data Assimilation**
  - Observations will increase by a factor of **10,000**
  - U.S. Government will invest **$Billions** in improved weather & climate observing systems and forecast services
  - NOAA is currently unable to use the expanded resources from this investment
- **National Test Bed**
  - $100's millions of government investment in research
  - Inadequate technology transfer to operations



Leveraging Partners/Resources

- **The NOAA CIPS supports separate solutions to the NESDIS and NWS backup requirements**
  - **Costs could be avoided if these solutions were co-located**
- **If an existing Government facility(ies) can be found to host the backup systems costs can be reduced**

Costs

NOAA CIP INITIATIVE FOR FY2003						
						COST THRU
	FY2003	**FY2004**	**FY2005**	**FY2006**	**FY2007**	***FY2007***
Acquistion/Hardware/Facility						
CCS Backup: Compute/systems	6.00	6.00	6.00	6.00	6.00	30.00
OSDPD Backup: Computers/systems	2.21	2.80	2.80	2.80	2.80	13.41
Faclity Upgrades	2.00					2.00
Subtotal:	10.21	8.80	8.80	8.80	8.80	45.41
Recurring O&M/Support						
Maintenance/Support/Facility lease	0.00	2.00	2.00	2.00	2.00	8.00
Total:	10.21	10.80	10.80	10.80	10.80	53.41

Program & Risk Management

- **Acquisition strategy**
  - Contracted separately using NWS and OSDPD contracts
  - Risk Management
    - *NWS system included as an option in the planned acquisition for next operational supercomputer for CCS*
    - *OSDPD backup incorporated into operational system acquisition contract*
  - Additional CCS funds provides price/performance incentive to vendors
    - *Allows backup to keep "in sync" with operational system*
      - Capacity, hardware, system software, comms, etc
  - Leverage and utilize contract monitoring and benchmark performance of operational system

Program & Risk Management

- IT security
  - Managed with same security infrastructure and procedures as operational systems
- COTS hardware/operating system software wherever possible
- Risk: locating an existing facility(ies)
  - Facility not identified
  - Option for vendor to provide facility

Program & Risk Management

- Implementation schedule
  - FY 02 – FY 03Q1 : finalize operating contingency plans, site survey
  - FY 03 Q2/Q3: facility agreement, system acquisition, begin initial installation, install telecommunications
  - FY 03 Q4/FY04 Q1: complete installation, testing
  - FY 04 Q1/Q2: perform critical backup supporting OSDPD move

Alternatives

- **Commercial Service (outsource)**
  - No commercial service has a computational system with sufficient capabilities to meet CIPS backup requirements.
  - Very high (nearly prohibitive) risk to a commercial service willing to accept the liability for providing OSDPD or CCS products during outages.
  - NWS computational requirement very large
    - *Need to sustain on-time product delivery*
    - *Precludes using existing "spare" capacity in supercomputing community*

- **Status Quo**
  - NWS: does not meet objective of 100% backup
  - OSDPD: does not provide any backup

Alternatives

- **Why a Separate Facility from Current Operations?**
  - Backups require sufficient geographical separation from operational system
  - Same event should not impact both operational and backup systems
    - *Power interruptions*
    - *Weather event (e.g hurricane, flood, tornado,etc)*
    - *Earthquake*
    - *Man-made disaster (e.g. biological, nuclear, conventional, fire)*

Alternatives

Can the costs be reduced further?

- Backup for OSDPD can be achieved for $2.8M recurring
- Cost reductions for the CCS backup reduces system size and capability.
  - Funding for CCS backup at $4M/year (two-thirds of hardware request)
    - Provides system baseline infrastructure (storage, connection, and I/O)
    - Provides very minimal processing capability
      - Resources provided would allow only ~40% - 50% backup of CCS models, with prime mesoscale model run at lower resolution

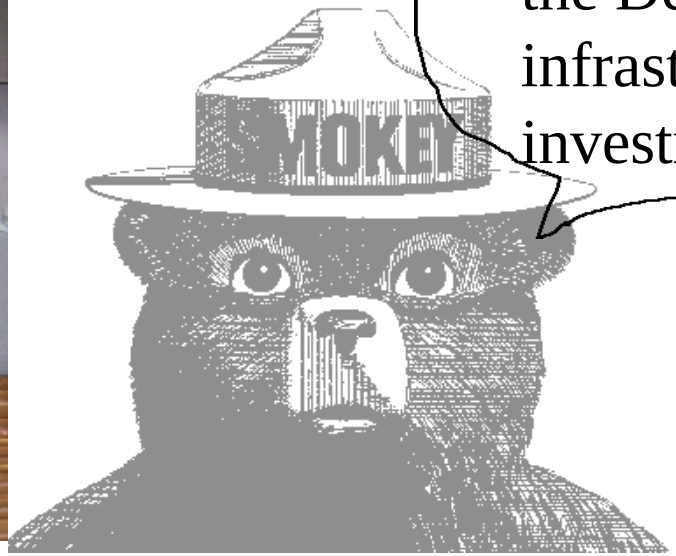
NOAA CIP
IT Architecture Compliance

• Adhere to IT Principles	• Yes - Fully
• Adhere to Policies and Standards	• Yes - Fully (IBM extensions waivered for performance)
• Adheres to Security Policy as Outlined in Principles	• Yes - Fully
• Align with Mission Processes	• Yes - Fully
• Align with the Information Model	• Yes – Fully
• Have a plan for Interfaces with Current or Planned Applications	• Yes - Fully
• Are Compatible with the Infrastructure in the Target Architecture	• Yes - Fully

Secretarial and Department Goals

- This is a pure CIP initiative for mission critical systems
  - Provides a collateral benefit of addressing an unmet resource requirement to support R&D
- Sustains vital support to Government agencies and the commercial weather industry if a disaster occurs
- Speeds the ROI of $Billions invested/to be invested in satellites

Cray C90 unusable after the Sept 1999 fire



Only YOU can protect the Department's infrastructure and investments!